

ASRS-36/36x2 with Controller-USB



Operational Manual

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1

Introduction

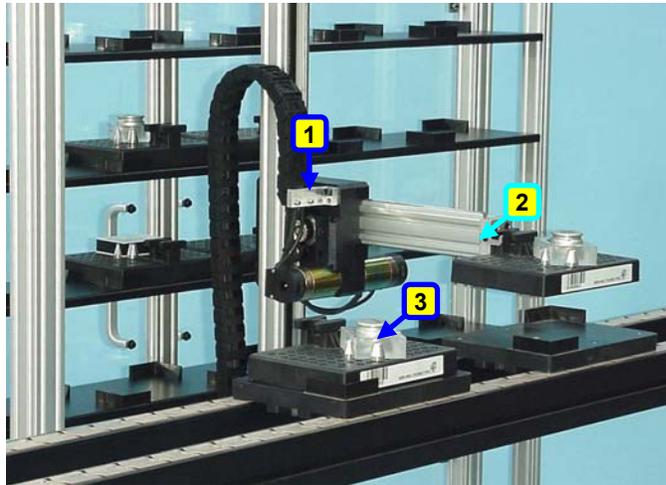
The ASRS is a floor-mounted automated storage and retrieval system containing 36 or 72 storage cells. The system's dedicated Cartesian robot transfers parts between storage cells and conveyor pallets stopped at the ASRS station. The ASRS Robotic Arm is controlled by a Controller-USB. An optional hand-held teach pendant can also be used for direct control of the ASRS Robotic Arm. The ASRS Storage Unit is enclosed in a transparent plexiglass casing that provides maximum safety while enabling students to observe its robotic operation.

This document describes how to install the ASRS and prepare it for use. It includes, installing the Controller-USB that is connected to the ASRS, powering up the controller and homing the robot connected to the ASRS. The ASRS-36 is displayed as follows:



1. Emergency Stop Button
2. Empty Pallet in Cells
3. Controller-USB
4. ASRS Door

Figure 1: ASRS 36 –Storage Unit



1. ASRS Robotic Arm
2. Gripper Grasping Template & Part
3. Template & Part on Conveyor

Figure 2: ASRS Robot Templates & Parts on Conveyor

ASRS Components

The ASRS contains the following components:

- **ASRS 36/36x2 Storage Unit:** A floor-mounted automated storage and retrieval system that contains 36 (or 72) storage cells arranged in a 6x6 (or 6x6 + 6x6) array. Storage cells in the ASRS contain templates (either empty or loaded with parts). The unit is used to store these templates containing raw materials prior to production as well as finished products following the production process and serves as a warehouse for parts in various stages of production.
- **Templates:** Templates are plastic trays which can hold various types of parts. They allow parts to be transported on the conveyor. A template contains a matrix of holes in which pins are placed to fit the dimensions of a part. Each arrangement of pins defines a unique template type. Each part may only be held by its assigned template. The handle, located on top of or in front of the template, facilitates grasping by a robot's gripper.
- **ASRS Robotic Arm:** The ASRS robotic arm is fully controlled by the controller and performs various *pick and place* tasks to transfer parts between storage cells and conveyor pallets stopped at the ASRS station. The ASRS robotic arm performs these tasks using a forklift gripper which is connected to the robotic arm. The robotic arm moves the gripper within the ASRS robot's work envelope.
- **Controller-USB:** Controls the ASRS robot using the SCORBASE application that supports the SCORBASE language (an advanced robotic programming language). The SCORBASE program accesses the Controller-USB through the PC USB interface.
- **Teach pendant:** A hand-held terminal used for controlling the robot and axes connected to the controller. The Teach Pendant contains function keys, and its LCD display shows the current status of the controller, the current user command, and system messages.

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Installation

This chapter describes how to connect the ASRS to the Controller-USB and how to install the SCORBASE software. For additional information on how to configure Controller-USB, refer to the *Controller-USB User Manual*.

It includes the following sections:

- **Connecting the Cables (Controller-USB)**, below
- **Installing the SCORBASE Software**, page 8

Connecting the Cables (Controller-USB)

Before begin connecting the cables, it is recommended that you familiarize yourself with the rear panel of Controller-USB.

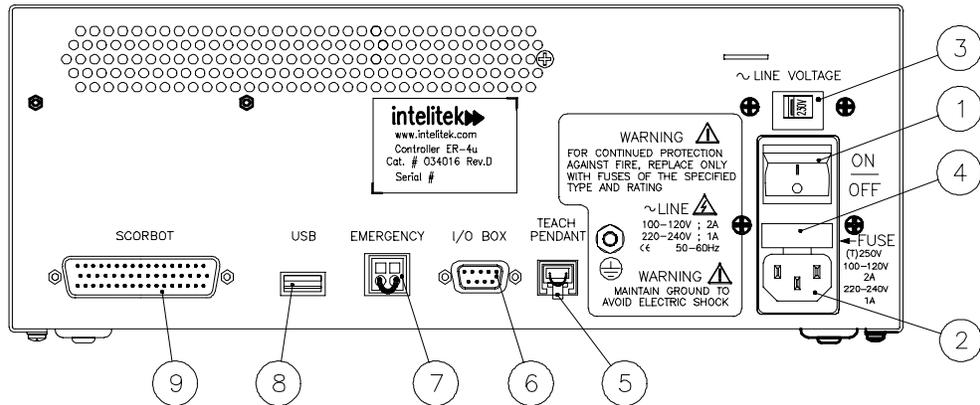


Figure 3: Controller-USB - Rear Panel

Legend: Controller Rear Panel	
1	Power On/Off Switch
2	Power Line 110/220VAC socket
3	Line Voltage Selector
4	AC Power Fuse Drawer - 110V 2A; 220V 1A
5	TEACH PENDANT connection
6	RS232 COM. port for future use
7	Remote EMERGENCY switch 2-pin connector
8	USB connector (to PC)
9	Robot 62-pin D-type high density connector

To connect the Controller-USB cables:

1. Install and configure your computer/terminal and monitor according to the manufacturer's instructions.
2. Make sure that Controller-USB voltage setting (3) matches your power supply.
3. Make sure the controller's power switch (1) is turned off.
4. Connect the controller's USB socket (8) to the USB socket on the computer.
5. Connect the adaptor to the ROBOT port (9) on the controller. Tighten the connector screws.
6. Connect the four cables coming from the ASRS motor to the four sockets of the adaptor. The cables and the sockets are labeled Axis 1, Axis 2, Axis 3 and Axis 4. Insert cable marked Axis 1 to the socket marked Axis 1, and continue until all four cables are connected to the four sockets. See Figure 4.

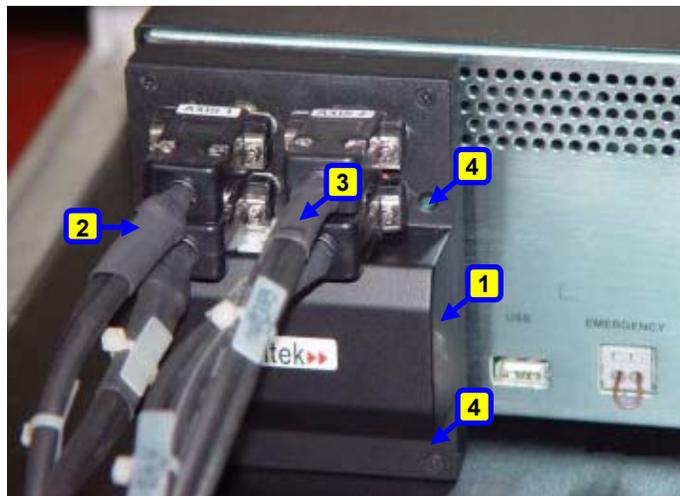


Figure 4: Adaptor and Four Cables

7. If a teach pendant will *not* be used, connect the emergency bypass plug to the teach pendant port (5) on the controller's rear panel.

To use a teach pendant, connect it to the TEACH PENDANT connector (5) on the controller's rear panel.

It is recommended that you set the Teach Pendant Auto/Teach switch to AUTO before you power on the system. If the switch is set to AUTO, the robot can be controlled either from the teach pendant or via Controller-USB. For more details, refer to the teach pendant's user manual.

8. Connect the power cable to the POWER socket (2) on the controller's rear panel and to a grounded AC power source.
9. Connect the two black cables from the ASRS to the remote EMERGENCY switch 2-pin connector ports (7) on the controller's rear panel. It does not matter which ASRS cable connects to which remote EMERGENCY switch 2-pin connector port. If the emergency switch bypass cable is already inserted between the remote EMERGENCY switch 2-pin connector ports, remove the emergency switch bypass cable and connect the two black ASRS cables.
10. Once you have made all the required hardware connections, you can turn on Controller-USB.
11. After you turn on the controller, the power indicator LED (which appears on the front panel of Controller-USB) lights up. Its color indicates whether the controller is communicating with the PC (green) or is not communicating (orange).

Installing the SCORBASE Software

After connecting the Controller-USB, the next step is to install the controller's SCORBASE software, as described in the following procedure.

Installing the SCORBASE Software:

1. Insert the CD into the CD-ROM drive to start the installation procedure.
2. If the procedure does not start, either:
 - From the Windows task bar, click Start | Run and type D:Setup (where D: is your CD drive),
or
 - Using Windows Explorer, explore the CD drive and click  Setup.
3. Wait until the Welcome window is displayed.



Figure 5: Welcome Window

4. Click Next to open the License Agreement Window.



Figure 6: License Agreement Window

5. Review the Intelitek software license agreement. You must accept the terms of this agreement in order to proceed with the installation. To accept, choose Yes. The Installation window opens.

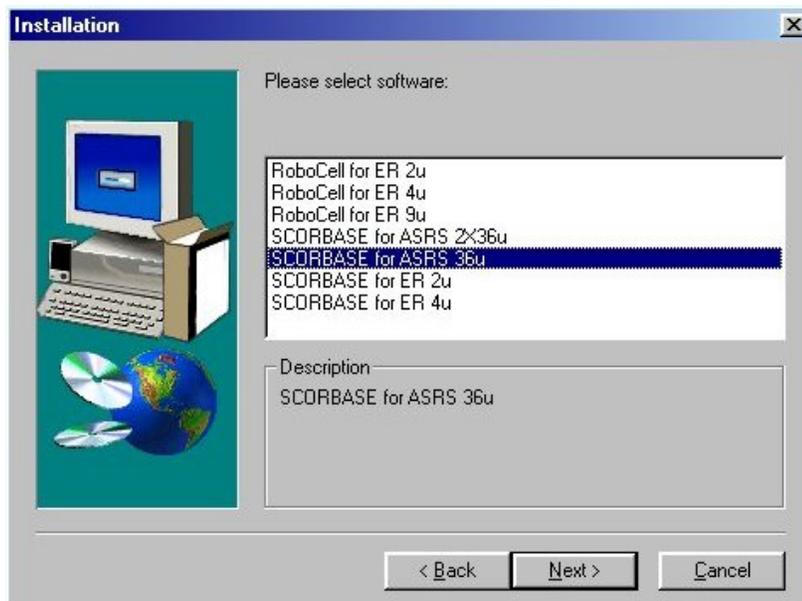


Figure 7: Software Selection Window

6. Select SCORBASE for ASRS 36u (or SCORBASE for ASRS 2x36u) and click Next. The robot that you select becomes the default robot while you are working in SCORBASE, although you can choose to open a new project and work with the other robot. See the Hardware Setup option in the Options Menu.

7. The RoboCell window opens. Select the interface language and click Next.



Figure 8: RoboCell Installation Window

8. The Choose Destination Location window opens.



Figure 9: Choose Destination Location Window

9. The default destination folder for the files is:
C:\Program Files\Intelitek\SCORBASE.
Click Next to accept the default, or click Browse to select another folder and then click Next to open the Select Program Folder window.

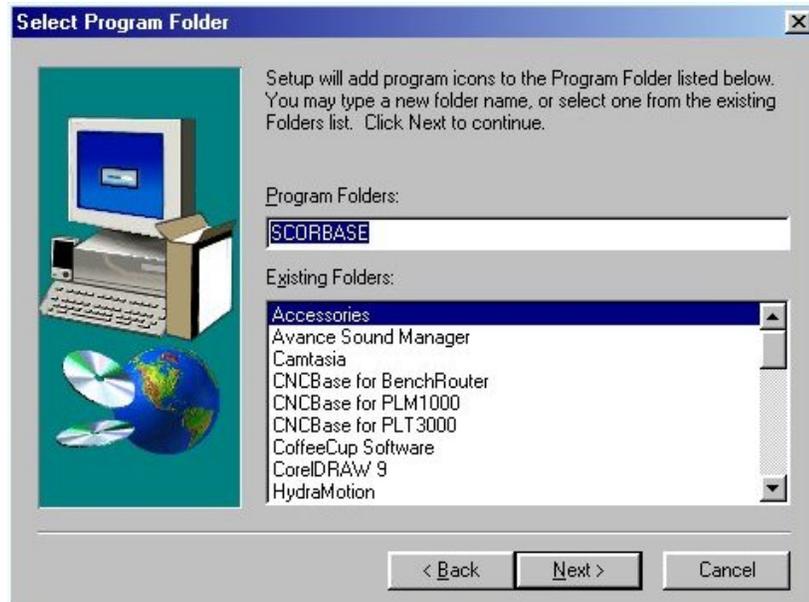


Figure 10: Select Program Folder Window

10. In the Select Program Folder window you are requested to select the folder to which the program icons will be added. Select SCORBASE.
11. Click Next to complete the installation procedure.

3

Operation

After connecting the wires and configuring the controller accordingly, and installing the software, the next step is to power up Controller-USB and home the robot. This will enable you to ensure the system is working properly with the software. For additional information on the Controller-USB configuration settings and so on, refer to the *Controller-USB User Manual*.

This section describes how to operate the controller and includes:

- **Powering Up Controller-USB**, page 13
- **Homing the Robot from the SCORBASE Software**, page 15
- **Testing the ASRS**, page 16

Powering Up Controller-USB

After installing the SCORBASE software and powering up the controller you can communicate directly with the controller from the SCORBASE main window.



Figure 11: Controller-USB – Front View

To power up the Controller-USB:

1. Turn on the controller's power switch (see the **ON/OFF** switch on the right side of the controller's rear panel).
2. Turn on and reboot your computer.
3. Select Start | Programs | Scorbases | SCORBASE. The following screen appears:

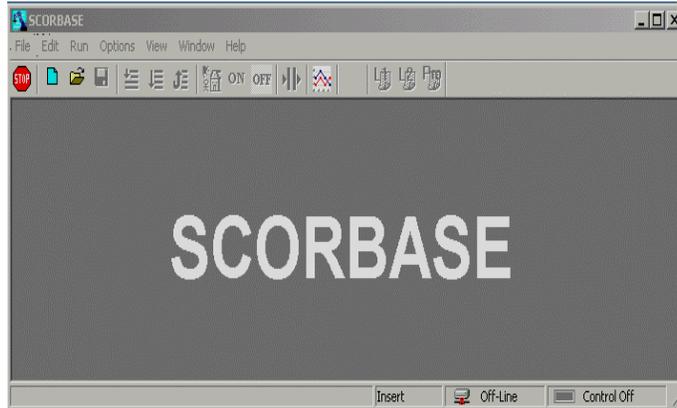


Figure 12: SCORBASE Opening Screen

If SCORBASE opens in Off-line mode or the controller is not detected, the program will load and operate in Off-line mode.

To put SCORBASE in On-line mode, select Options | On - Line.

Only one application of SCORBASE can be active at a time.

You can now communicate directly with the controller. For additional information on configuring the controller refer to the *Controller-USB User Manual*.

Homing the Robot from the SCORBASE Software

You can home the robot connected to the Controller-USB, from your computer using the SCORBASE software, as described below.

To home the robot:

1. Identify the Controller-USB located at the ASRS station and ensure it is turned on.
2. Activate the SCORBASE software, as described in *Powering Up Controller-USB*, in the previous section.
3. If you are using an ASRS 36x2, make sure the robotic arm is not between storage cells, and then move the robotic arm 50 cm away from the home position. You can use either the Manual Movement dialog box or the Teach Pendant.

4. Click the Search Home  icon.

A window opens displaying the number of the axis currently being homed. Each time an axis is successfully homed, a checkmark appears next to the axis number. After the four axes have been homed, a checkmark appears next to Robot.

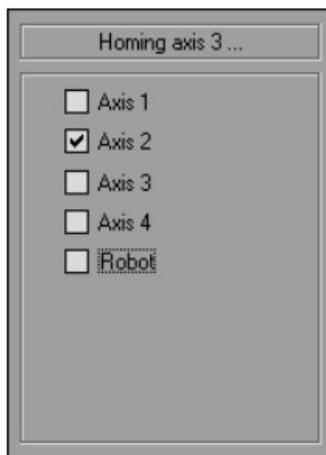


Figure 13: Number of Axis being Homed

Testing the ASRS

After homing the robot, it is a good idea to test the ASRS. This can be done easily by running a pre-programmed test file.

*Note: If you are using the Teach Pendant, follow the instructions in the following section, **To test the ASRS using the Teach Pendant.***

To test the ASRS:

1. Check that all of the ASRS cells are empty.
2. From SCORBASE, select **Open Project** and open **Test 2.WS**. Test 2 checks that the robot moves the template to the corners correctly.
3. From the *Teach Positions* section, set the **Position Number** to **1**. See number 2 in Figure 16.

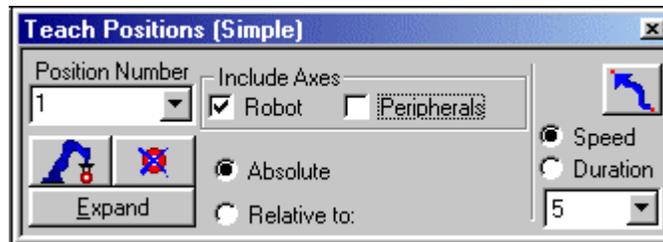


Figure 14: Tech Positions Section

4. Click **Go to the selected position** . The robot should move from the home position to position number 1.
5. From the *Teach Positions* section, set the **Position Number** to **101**. See number 3 in Figure 16.
6. Click **Go to the selected position** . The robot should move from position number 1 to position number 101.
7. Insert the template in cell number 1 so that the gripper grips the template. The gripper arm should be 2 mm above the bottom of the cell.
8. From the *Manual Movement* section, set **Speed** to **1**.

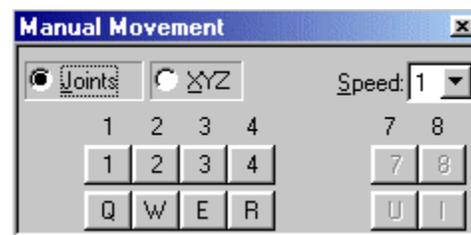


Figure 15: Manual Movement Section

9. From the Manual Movement section, check that the **Joints** radio button is selected (and not **XYZ**).

10. From the *Manual Movement* section, click **2** or **W**. This moves the Z-axis of the robot (and the template) up and down.
11. Check that the robot movement is smooth.
12. If the robot movement is not smooth (for example, if the gripper collides with the cell), adjust the axes from the *Manual Movement* section.
13. Once the robot movement is smooth, click **Record Position**  to record that position as 101.
14. From the *Teach Positions* section, set the **Position Number** to **1** to move the robot back to position number 1.
15. If you are using an ASRS 36x2, repeat steps 3 to 14 replacing **1** with **2** and **101** with **201**.
16. Save the project.
17. Click **Run Single Cycle**  to run the program.



1. Home position
2. Position 1
3. Position 101
4. Position 2
5. Position 201

Figure 16: Different Positions in the ASRS 36x2

To test the ASRS using the Teach Pendant:

1. Connect the Teach Pendant to the Teach Pendant socket (see #5 in Figure 3).
2. Check that all of the ASRS cells are empty.
3. From SCORBASE, select **Open Project** and open **Test 2.WS**. Test 2 checks that the robot moves the template to the corners correctly.
4. Take the Teach Pendant and turn the TEACH/AUTO button to TEACH.
5. Press **MOVE, 1, ENTER** to move the robot to position number 1.
6. Press **MOVE, 101, ENTER** to move the robot to position number 101.
7. Insert the template in the cell so that the gripper grips the template. The gripper arm should be 2 mm above the bottom of the cell.
8. Press **SPEED (%), 3, ENTER** to set the speed to 3.
9. Check that the Teach Pendant is in JOINTS mode.
10. Press **2** and then + or -. This moves the Z-axis of the robot (and the template) up and down.
11. Check that the robot movement is smooth.
12. If the robot movement is not smooth (for example, if the gripper collides with the cell), adjust the axes using the Teach Pendant. Press **1** and then + or - to move the robot from side to side. Press **2** and then + or - to move the robot (and the template) up and down.
13. Once the robot movement is smooth, press **RECORD POSITION, 101, ENTER** to record that position as 101.
14. Press **MOVE, 1, ENTER** to move the robot back to position number 1.
15. If you are using an ASRS 36x2, repeat steps 5 to 14 replacing **1** with **2** and **101** with **201**. See numbers 4 and 5 in Figure 16.
16. Save the project.
17. Turn the TEACH/AUTO button back to AUTO.
18. Click **Run Single Cycle**  to run the program.

4

Maintenance

It is recommended to oil the ASRS either every 3 months or after the system has been working for 15 hours (the earliest of the two).

This chapter describes the oiling locations of the ASRS.

Oiling the ASRS

The following procedure describes the oiling locations of the ASRS.

To oil the ASRS:

- Spray WD-40 inside the timing belt pulleys in the four locations as shown in the figures below.

Note: You may need to turn the Y-axis, as shown in the figures below, in order to easily reach all four locations.

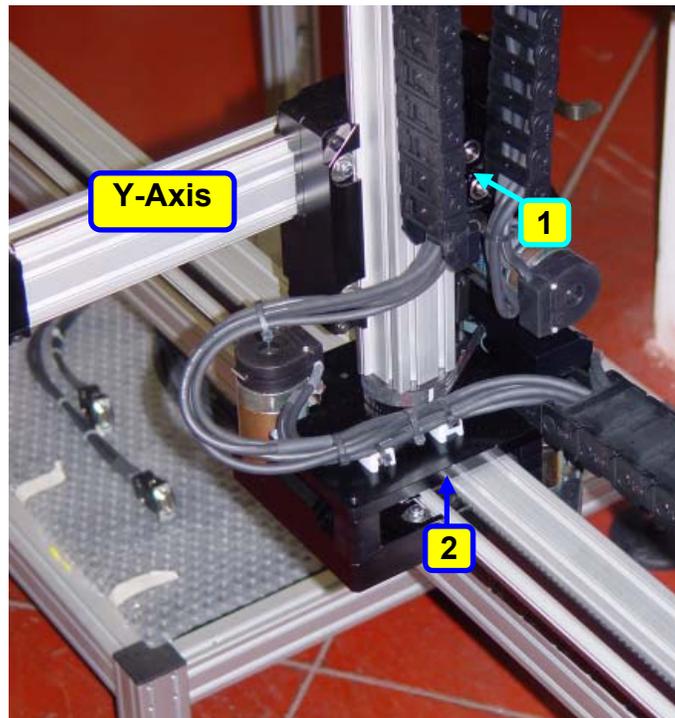


Figure 17: ASRS Oiling Locations 1 and 2

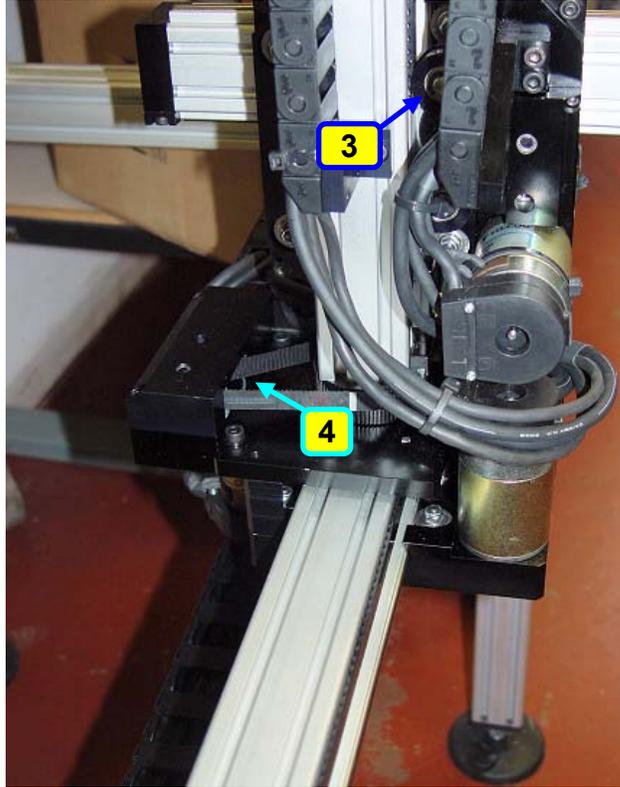


Figure 18: ASRS Oiling Locations 3 and 4